

## Message Text

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C O N F I D E N T I A L STATE 140965

E.O. 11652: GDS

TAGS: NATO, ETEL, MARR

SUBJECT: RESPONSE TO QUESTIONS ON DSCS III/NATO IV

REF: USNATO 4482

1. IN RESPONSE TO PARA 11F OF REF, FOLLOWING INFORMATION  
IS PROVIDED FOR YOUR USE/GUIDANCE.

2. REF ASKS FOR A LAYMAN'S DESCRIPTION OF THE ANTI-JAM  
CAPABILITIES OF THE DSCS III SATELLITE. THE DSCS III  
SATELLITE CONSISTS OF A SIX CHANNEL CONFIGURATION WITH  
CHANNELS OF NEARLY EQUAL BANDWIDTH (60, 60, 85, 60, 60,  
50 MHZ). THE DESCRIPTION FOLLOWS:

A. ONE RECEIVE 61 BEAM ANTENNA CONNECTED TO SATELLITE  
CHANNELS ONE THROUGH FOUR.

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B. TWO 19 BEAM TRANSMIT ANTENNAS (ONE FOR CHANNELS ONE  
AND THREE AND ONE FOR CHANNELS TWO AND FOUR).

C. ANY ONE OF CHANNELS ONE, TWO, OR FOUR CAN BE  
SWITCHED FROM THE 19 BEAM ANTENNA TO A HIGH GAIN PARA-  
BOLIC DISH ANTENNA THAT COVERS A SPOT ABOUT 1000 MILES

IN DIAMETER. FLEXIBILITY IN COVERAGE AREA AND HIGHER  
EIRP ARE THE RESULT OF THIS TYPE OPERATION.

D. CHANNELS FIVE AND SIX OF THE DSCS III ARE CONNECTED TO EARTH COVERAGE HORN ANTENNAS ON THE UPLINK AND DOWNLINK AND ESSENTIALLY OFFER LITTLE ANTI-JAM SERVICE. SINCE THE JAMMING THREAT OF GREATEST CONCERN IS FOR AN UPLINK JAMMER, THE 61 BEAM RECEIVE ANTENNA PROVIDES ANTI-JAM PROTECTION TO FOUR CHANNELS OF THE DSCS III. THE 61 BEAM RECEIVE ANTENNA IS SIMILAR IN CONCEPT TO HAVING 61 PARABOLIC DISH ANTENNAS, EACH PROVIDING SPOT COVERAGE AND THESE SPOTS CLUSTERED SIDE BY SIDE SO THAT THE CLUSTER OF BEAMS PROVIDES EARTH COVERAGE. EACH UPLINK JAMMING SIGNAL RECEIVED AT THE SATELLITE BY THE 61 BEAM ANTENNA APPEARS WITHIN A SPOT BEAM OF BETWEEN TWO OR THREE ADJACENT SPOT BEAMS. THE ANTENNA IS COMMANDABLE THROUGH AN ANTI-JAM COMMAND LINK (ALSO AT X-BAND), SUCH THAT EACH BEAM'S AMPLITUDE AND PHASE CAN BE ADJUSTED TO MAXIMIZE OR MINIMIZE THE SIGNALS BEING RECEIVED BY EACH BEAM. THUS, FRIENDLY SIGNALS CAN BE PROVIDED A POWER ADVANTAGE OVER UNFRIENDLY SIGNALS. THE FACT THAT THERE ARE 61 INDEPENDENT BEAMS FORMING THE RECEIVE ANTENNA COVERAGE PERMITS THE SIMULTANEOUS ELIMINATION (OR NULLING) OF MULTIPLE JAMMERS. THE TOTAL NUMBER OF JAMMERS THAT CAN BE NULLED DEPENDS UPON THEIR CONFIDENTIAL

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GEOGRAPHIC DISTRIBUTION. IN NEARLY ALL OPERATIONAL SITUATIONS ALL FRIENDLY TERMINALS WILL BE ABLE TO RESUME NORMAL TRAFFIC ONCE THE 61 BEAM ANTENNA HAS BEEN COMMANDED TO MINIMIZE THE EFFECTS OF THE JAMMER (OR JAMMERS). WHERE THE JAMMER IS IN CLOSE PROXIMITY WITH A FRIENDLY TERMINAL, THE FRIENDLY TERMINAL WILL STILL BE ABLE TO COMMUNICATE EITHER AT FULL TRAFFIC LEVELS BUT LOWER QUALITY SERVICE, OR AT SOME REDUCED TRAFFIC LEVEL WITH NORMAL QUALITY SERVICE. AS CAN BE SEEN, THE DSCS III SYSTEM IS CAPABLE OF PROVIDING ANTI-JAM PROTECTION AGAINST MULTIPLE JAMMERS.

3. SAMSO EVALUATED THE COST IMPACT ON THE NATO IV TAILORED OPTION USING AVAILABLE SATELLITE BUSES. SINCE THIS WAS NOT A PART OF SAMSO ORIGINAL TASKING BY NICSMA, THESE COSTS ARE BEST ESTIMATES.

#### A. ASSUMPTIONS

(1) USE OF A DEVELOPED SATELLITE BUS THAT IS EXPECTED

TO BE AVAILABLE IN THE 1980-84 TIME FRAME.

(2) SOME BUS UPGRADING FOR HARDNESS AND SGLS REQUIREMENTS.

(3) OPTION V TRANSPONDER AND PROCESSOR.

(4) USE OF HAWKER-SIDDELEY TYPE OF ANTENNA AS PROPOSED BY THE UK.

(5) GSE/TD REDUCED TO REFLECT USE OF PREVIOUSLY DEVELOPED BUS.

(6) REMAINING FACTORS ESTIMATED PER PHASE IV STUDY.

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## B. METHODOLOGY

(1) TRANSPONDER/PROCESSOR/ANTENNA NON-RECURRING COSTS WERE DERIVED FROM SAMSO COST MODEL BASED ON CONSTRAINTS DOCUMENT AND UK'S DESCRIPTION OF ANTENNA.

(2) COSTS OF INTEGRATING PAYLOAD TO BUS, SYSTEM TEST AND VALIDATION WERE BASED ON AN AVERAGE OF QUOTES RECEIVED FROM A SURVEY OF US CONTRACTORS.

(3) RECURRING COSTS ARE DERIVED FROM THE SAMSO COST MODEL USING CONTRACTOR'S TECHNICAL BUS INPUTS. OPTION V TRANSPONDER SIZING, AND THE UK ANTENNA DESCRIPTION.

(4) GSE/TD WAS BASED ON A ONE YEAR DEVELOPMENT, FOUR YEAR INTEGRATION/PRODUCTION AND TEN YEARS OF SUSTAINING ENGINEERING.

(5) REMAINING FACTORS ESTIMATED PER PHASE IV STUDY.

## C. ESTIMATE OF NATO IV TAILORED OPTION USING AVAILABLE BUSES (FY 78 MILLIONS OF DOLLARS)

DEVELOPMENT	32.8
PRODUCTION (3 S/C)	60.9
AGE	2.5
LOOS	1.9
FEE	11.7
INCENTIVE	9.4
STORAGE	3.4
GSE/TD	15.4
TRANSPORTATION	1.2

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SPACECRAFT SUBTOTAL 139.2

LAUNCH COSTS (STS/PAM-A,  
US RATE) 42.4

PROGRAM TOTAL 181.6

D. COMPARISON WITH PREVIOUS SAMSO ESTIMATES USING SMALL  
ANTENNA ON OPTIONS 4 AND 5 (FY 78 DOLLARS)

OPTION I II III IV V

COST 130.3 177.8 134.1 208.9 242.2

4. AN ESTIMATE OF THE AMOUNT AND TYPES OF WORK THE  
DSCS III CONTRACTOR COULD SHARE WITH NON-US CONTRACTORS  
ON NATO DSCS III SATELLITES ARE ITEMIZED BELOW. THE  
FOLLOWING ASSUMPTIONS HAVE BEEN MADE:

A. NO MODIFICATIONS TO THE DSCS III.

B. BUILD-TO-PRINT GENERAL ELECTRIC DESIGNS.

C. NO PROPULSION ELEMENTS.

D. PRINCIPALLY HARDWARE GENERAL ELECTRIC CURRENTLY  
BUILDS IN-HOUSE FOR DSCS III.

E. GENERAL ELECTRIC PROVIDES ALL HIGH RELIABILITY,  
RADIATION HARDENED, ELECTRONIC PIECE PARTS.

F. THE CANDIDATE HARDWARE ELEMENTS FOR PRODUCTION  
SHARING INCLUDE:

(1) POWER SUBSYSTEM - SOLDAR ARRAY ASSEMBLY INCLUDING  
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CELLS, SUBSTRATES, YOKE, HINGES AND SUPPORTING MECHANICAL

ELEMENTS AS WELL AS SOLAR ARRAY DRIVE, SHUNT POWER  
DISSIPATORS, POWER REGULATION UNIT, POWER CONTROLLERS,  
ORDNANCE CONTROLLER AND BATTERIES.

(2) VARIOUS STRUCTURAL ELEMENTS

(3) ATTITUDE CONTROL SUBSYSTEM -- ATTITUDE CONTROL  
ELECTRONICS, EARTH SENSORS, SUN SENSORS, RATE GYRO,  
AND REACTION WHEELS.

(4) TELEMETRY TRACKING AND COMMAND - SHF BEACON  
TRANSMITTER, SHF/S-BAND DOWN CONVERTER, COMMAND  
TELEMETRY UNIT, REMOTE TELEMETRY UNIT, AND S-BAND  
TRANSPONDER/DIPLEXER/ANTENNA.

(5) COMMUNICATIONS SUBSYSTEM - MBA RECEIVE/TRANSMIT  
ANTENNA MECHANICAL ASSEMBLIES, EARTH COVERAGE HORNS,

GIMBAL ANTENNA ASSEMBLY, LOW NOISE AMPLIFIERS, TUNNEL DIODE AMPLIFIER/LIMITER, MIXER MODULE, DRIVE AMPLIFIERS, TWTA'S 40 AND 10 WATT, INPUT/OUTPUT MULTIPLEXERS, FILTERS, FREQUENCY GENERATOR/FREQUENCY STANDARD, AND VARIOUS ELECTRONIC SUBELEMENTS SUCH AS SWITCHES AND COUPLERS. THE PRESENT BREAKDOWN OF SUBSYSTEMS TASKS, BY PERCENTAGE OF THE TOTAL, IS AS FOLLOWS:

SUBSYSTEM OR TASK	PERCENT OF TOTAL
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SHF ANTENNAS	8.7
SHF TRANSPONDER	23.7
SINGLE CHANNEL TRANSPONDER	7.2
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ATTITUDE CONTROL	6.8	
TELEMETRY, TRACKING AND COMMAND	8.9	
ELECTRICAL POWER	9.0	
PROPULSION	5.5	
STRUCTURE	5.2	
THERMAL CONTROL	2.2	
SYSTEM TEST AND EVALUATION	6.4	
PROGRAM MANAGEMENT/SYSTEM ENGINEERING	8.9	
FLIGHT OPERATIONS	7.5	
TOTAL	100.0	

CONSIDERING CANADIAN/EUROPEAN SUPPORT ON SELECTED ITEMS, THE POTENTIAL PERCENT CANADIAN/EUROPEAN PARTICIPATION BY SUBSYSTEM OR TASK FOR NATO IV (OPTION I) IS AS FOLLOWS:

PERCENT SUBSYSTEM OR TASK	PERCENT EURO/ CANADIAN PARTICIPATION OF TOTAL	PERCENT CANADIAN PARTICIPATION
SHF ANTENNAS	10.1	9.5
SHF TRANSPONDER	23.4	--
SINGLE CHANNEL TRANSPONDER	7.8	3.4
ATTITUDE CONTROL	6.9	2.3
TELEMETRY, TRACKING AND COMMAND	9.3	3.7
ELECTRICAL POWER	9.2	3.9
PROPULSION	4.9	--
STRUCTURE	5.9	4.7
THERMAL CONTROL	2.0	--
SYSTEM TEST AND EVALUATION	5.8	--
PROGRAM MANAGEMENT/ SYSTEM ENGINEERING	7.9	--
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FLIGHT OPERATIONS 6.8 --

TOTAL 100.0 27.5

5. WITH REGARD TO THE PROVISION OF GFE CRYPTO AND CONTROL EQUIPMENT FOR A NATO TAILORED SATELLITE, THE US POLICY ON THE RELEASE OF BATSON TO NATO MUST BE ESTABLISHED BY THE US COMMUNICATIONS SECURITY BOARD. ONCE THE COMSEC BOARD APPROVES RELEASE, BATSON X-BAND ANTI-JAM COMMAND EQUIPMENT CAN BE RELEASED TO NATO UNDER THE FOLLOWING CONDITIONS:

A. NO PRODUCTION SHARING.

B. SUFFICIENT INTERFACE INFORMATION AND LOGIC DETAIL WILL BE PROVIDED TO PERMIT THE CONTRACTOR TO DESIGN HIS SATCOM SYSTEM TO ACCEPT THE BATSON EQUIPMENTS.

C. SEALED BATSON EQUIPMENTS WILL BE PROVIDED FOR INTEGRATION INTO THE SPACE VEHICLES.

D. GROUND CONTROL EQUIPMENTS WILL BE DEPLOYED AT NATO MANNED VICE NATIONAL MANNED SGT'S.

E. MAINTENANCE ON BATSON EQUIPMENTS WILL BE LIMITED TO US PERSONNEL ONLY.

6. A PRELIMINARY REVIEW OF THE ISSUES ASSOCIATED WITH

SAMSO MANAGEMENT OF THE NATO IV PROGRAM FOLLOWS:

A. THE AIR FORCE COULD PROVIDE SAMSO/AEROSPACE SUPPORT  
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UNDER THE CONDITION THAT NATO WOULD AGREE TO THE US GOVERNMENT (USG) CONDUCTING AND MANAGING THE NATO SATCOM IV SPACE SEGMENT ACQUISITION UNDER NORMAL USG FOREIGN MILITARY SALES (FMS) POLICIES AND PROCEDURES. CONTROLLED BY THE ARMS EXPORT CONTROL ACT. AS SUCH, SAMSO/AEROSPACE WOULD CONDUCT THE PROGRAM IN THE SAME MANNER AS NATO II AND NATO III USING ALL APPLICABLE DOD/USAF REGULATIONS, INCLUDING NORMAL ARMED SERVICES PROCUREMENT REGULATIONS (ASPR) POLICIES AND PROCEDURES. IT IS POSSIBLE THAT THIS METHOD COULD INCLUDE SOLICITING PROPOSALS FROM FOREIGN INDUSTRY.

B. ONLY IF THE METHOD DESCRIBED ABOVE IS ACCEPTED

WILL THE USG PERFORM PROCUREMENT FUNCTIONS AND THEN ONLY IN A "BUSINESS AS USUAL" MANNER. USAF PROCUREMENT EXPERTISE IS LIMITED TO NORMAL DOD PROCEDURES, THROUGH US STATUTES AND THE ASPR. IF USAF WERE TO PROCURE VIA OTHER PROCEDURES, SUCH AS THE NATO PROCUREMENT PROCEDURES GOVERNED BY NATO DOCUMENT AC/4-D/2261 (FINAL) DATED SEP 1974, THE PROBLEMS THAT WOULD EXIST INCLUDE:

- (1) THE EXTENT OF THE PROCURING CONTRACTING OFFICERS AUTHORITY BASED ON NATO DELEGATION IS NOT DEFINED.
- (2) THE PERFORMANCE OF CONTRACT ADMINISTRATION FUNCTIONS (WHO, WHAT AND WHERE) SINCE THE PROJECT COULD INVOLVE A PRIME AND SEVERAL SUBCONTRACTORS IN DIFFERENT COUNTRIES.
- (3) LEGAL PROCEDURES, PENALTIES OR CORRECTIVE ACTIONS TO BE APPLIED IN THE EVENT OF DISPUTES OR DEFAULT BETWEEN THE PRIME CONTRACTOR AND SUBCONTRACTORS OR BETWEEN CONTRACTORS AND THE PROCURING AGENCY.

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- (4) CONTRACTURAL TERMS AND CONDITIONS BETWEEN THE PRIME CONTRACTOR AND SUBCONTRACTORS, PARTICULARLY IF CONTRACTORS WERE OF DIFFERENT COUNTRIES.
- (5) PROCEDURES FOR AUDIT OF CONTRACTOR FINANCIAL RECORDS.
- (6) NATO FUNDING PROCEDURES INCLUDING METHODS OF PAYMENT TO CONTRACTORS AND EFFECT OF CURRENCY EXCHANGE RATES.
- (7) QUALITY ASSURANCE PROCEDURES.

C. IN ADDITION TO FMS PROCEDURES, A FORMAL MEMORANDUM OF UNDERSTANDING (MOU) WITH NATO APPEARS NECESSARY TO DESCRIBE SPECIFIC DETAILS OF THE USAF SUPPORT. EVEN THOUGH MANY OF THE FOLLOWING ITEMS WOULD BE GOVERNED BY STANDARD FMS PROCEDURES, WE BELIEVE THAT, TO AVOID MISUNDERSTANDING, THE MOU WOULD NEED TO INCLUDE:

- (1) PROGRAM DESCRIPTION WITH APPLICABLE NATO REQUIREMENTS AND THREAT ESTIMATES.
- (2) ORGANIZATIONAL AND MANAGEMENT STRUCTURE INCLUDING NATO PARTICIPATION IN CONTRACT PREPARATION AND PROGRAM EVALUATION.

(3) SPECIFIC PROCUREMENT CONDITIONS TO INCLUDE METHOD OF CONTRACTING, PRODUCTION SHARING, TERMINATION, DISPUTES AND CONTRACT ADMINISTRATION.

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(4) FINANCIAL ASPECTS INCLUDING PAYMENT FOR US SERVICES AND CONTRACTORS, TAXES AND DUTIES, ECONOMIC PRICE ADJUSTMENT AND CHANGES IN EXCHANGE RATES.

(5) PUBLIC AFFAIRS.

(6) SECURITY.

(7) WORKING LANGUAGE.

D. IF NATO AGREES THAT SATCOM IV SPACE SEGMENT SHOULD BE ACQUIRED USING NATO PROCUREMENT PROCEDURES, THE AIR FORCE WILL NOT PROVIDE PROCUREMENT, FINANCIAL ANALYSIS OR CONTRACT ADMINISTRATION SUPPORT. THE DIRECT, INTEGRAL RELATIONSHIP BETWEEN OVERALL PROGRAM MANAGEMENT AND PROGRAM TECHNICAL SUPPORT PRECLUDES LOGICAL SEPARATION OF THESE FUNCTIONS, HOWEVER, IF NATO ESTABLISHES PROGRAM OFFICE TO EVALUATE, AWARD AND ADMINISTER A CONTRACT FOR NATO IV SATELLITES, THE AIR FORCE MAY CONSIDER PROVIDING LIMITED, WELL-DEFINED TECHNICAL ASSISTANCE. IT WOULD BE NECESSARY FOR NATO TO SPECIFICALLY DETAIL TECHNICAL ASSISTANCE NEEDS IN A MOU BEFORE THE AIR FORCE COULD COMMIT TO

PROVIDING SAMSO/AEROSPACE TECHNICAL ASSISTANCE WITHOUT OVERALL PROGRAM MANAGEMENT RESPONSIBILITIES.

E. REGARDLESS OF ANY METHOD WHICH MAY BE SELECTED TO SUPPORT A NATO TAILORED SATCOM IV SPACE SEGMENT, ADDITIONAL MANPOWER AUTHORIZATIONS WOULD BE REQUIRED AT SAMSO. A DETERMINATION MUST BE MADE AS TO WHETHER THE PROJECT WILL BE CONSIDER A COOPERATIVE EFFORT. ELABORATE MECHANISMS WILL BE REQUIRED TO CONTROL THE POSSIBLE TRANSFER OF US TECHNOLOGY (E.G., SEPARATE MUNITIONS CASES FOR EACH TECHNOLOGY TRANSFER TO FOREIGN CONTRACTORS FROM US CONTRACTORS).

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7. YOU ARE AUTHORIZED TO PROVIDE THE ABOVE INFORMATION TO NATO IN RESPONSE TO NAC/4717 AND TO MEMBERS OF THE JCEWG AS APPROPRIATE.

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